

AIM-120 AMRAAM



Air Force ACAT IC Program

Total Number of Systems:	10,917 (USAF & USN only)
Total Program Cost (TY\$):	\$10,399M
Average Unit Cost (TY\$):	\$953K
Full-rate production:	3QFY94
SEP Production	3QFY92

Prime Contractor

Raytheon

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2020

AIM-120 is an all weather, radar guided, air-to-air missile with launch-and-leave capability in both the beyond-visual-range and within-visual-range arenas, enabling a single aircraft to simultaneously engage multiple targets with multiple missiles. The U.S. Air Force and Navy, as well as several foreign military forces use AIM-120. Currently employed by the F-15C, F-15E, F-16, and F/A-18C/D, AIM-120 will also be employed by the F/A-18E/F, F-22, and the Joint Strike Fighter.

The AIM-120B missile resulted from the Advanced Medium Range Air-to-Air Missile (AMRAAM) Producibility Enhancement Program. Major improvements in the missile included a new digital processor, erasable programmable read-only memory, and five electronic unit hardware chassis upgrades. AIM-120B is currently in production for foreign military sales only.

The AIM-120C was developed with clipped missile's wings and fins to reduce its box size from 17.4 to 12.5 inches. This allowed for increased internal carriage loadout in the F-22. Block change

lethality improvements are being incorporated into the missile from Lot 8 and beyond, culminating in a new warhead and lengthened rocket motor in Lot 12. All current U.S. deliveries are of the AIM-120C configuration.

The AMRAAM P³I Phase 3 development program is underway. The Phase 3 missile will include new guidance section hardware and software. The antenna, receiver, and signal processing portions of the system are being upgraded to handle the requirements to counter new threats, and will be compressed to create room for future growth. Some existing software will be re-hosted to a new Higher Order Language (C++), some existing software will be re-hosted and modified to function with the new hardware, and some additional software algorithms are being written to react to the new Phase 3 threats.

AIM-120 contributes to *Joint Vision 2020* by providing the warfighter with a *precision engagement* weapon.

BACKGROUND INFORMATION

The AMRAAM program entered FSD in September 1982. The DAB approved LRIP in June 1987; authorized continued LRIP in May 1991; and entered full-rate production (Milestone III) in April 1992. The Air Force declared AMRAAM IOC with the F-15 in September 1991, and with the F-16 in January 1992. The Navy declared AMRAAM IOC in October 1993.

FOT&E(1) was completed in May 1993. FOT&E(2) started in May 1993 and completed in December 1995. This phase of testing included the launch of 40 missiles from 12 shot profiles under various test conditions and continued the captive-carry reliability program (CCRP) testing on the F-16. Missiles from production Lots 4 through 8, including AIM-120A and AIM-120B missiles, were tested on F-15 and F-16 aircraft. Twenty-four of the live launches were missiles from CCRP inventory. The live shots were designed to evaluate missile end game performance against advanced ECM threats and warhead lethality in more challenging end game scenarios. The final FOT&E(2) live launch test event occurred in December 1995.

An updated TEMP and Test Plan to define FOT&E(3) activities was approved in 1996. FOT&E(3) emphasizes testing of lethality improvements incorporated in missiles from Lot 8 and higher, culminating with the new warhead in Lot 11 and rocket motor in Lot 12. The 1996 TEMP included an LFT&E characterization of the new contact fuze and testing of the new warhead against bomber components, as requested by DOT&E. The TEMP approval letter also stated that DOT&E would submit an LFT&E report to Congress at completion of FOT&E(3).

FOT&E(3) is an ongoing joint Air Force and Navy evaluation divided into two phases: 3A and 3B. The first phase, designated FOT&E(3A), evaluated Lots 8 through 10 hardware and software tapes 5 and 7. This test phase was completed in August 1999 and included 26 live launches and multiple AMRAAM Captive Equipment missions, along with a 3,712-hour CCRP. The second phase, FOT&E(3B), started planning in October 2000 and incorporates four concepts: (1) lot verification live launches; (2) periodic AIM-120 software validation and regression live launches; (3) captive carry testing, suitability analysis, and live launches of projected hardware modification; and (4) AMRAAM captive equipment missions and computer simulations to further validate/evaluate missile capabilities/performance based on field user inquiries.

LFT&E was conducted using arena tests for AMRAAM Pre-Planned Product Improvement (P³I) warhead against a suite of gray and threat targets. DOT&E participated and provided oversight for the first arena test against a cruise missile and a bomber section on April 7, 1998. Pre-test predictions were provided to DOT&E after the test was executed. The second arena test, against two foreign fighter targets, was completed in October 1998. A third arena test against the same foreign fighter targets was conducted in April 1999.

The TEMP has again been updated to outline a comprehensive developmental and operational test and evaluation effort for the AMRAAM (P³I) Phase 3 Program. The updated TEMP was put into the coordination/approval process in October 2000. This document outlines extensive OT involvement in the contractor's modeling and simulation validation processes and also describes plans for combined developmental/operational testing of two software tape upgrades: Tape 7D High Off-Boresight (HOBS) for AIM-120C and Tape 5 Rev 4 for AIM-120B.

TEST & EVALUATION ACTIVITY

FOT&E(3B) planning started in October 2000 and incorporates four concepts: (1) lot verification live launches; (2) periodic AIM-120 software validation and regression live launches; (3) captive carry testing, suitability analysis, and live launches of projected hardware modifications; and (4) AMRAAM captive equipment missions and computer simulations to further validate/evaluate missile capabilities/performance based on field user inquiries. The live launch program will be conducted at Eglin Gulf Test Range, FL, White Sands Missile Range, NM, and Naval Air Warfare Center Weapons Division, CA, and consists of missiles from Lots 12 and 13 and five Captive Carry Reliability Vehicles (CCRVs) from Lot 8. A CCRP will be conducted by COMOPTEVFOR during FOT&E(3B) to establish a baseline for the F/A-18E/F and also to test the latest version of the AMRAAM aboard ship. These CCRVs will be re-configured and fired to further validate missile reliability and performance. In addition, the HOBS capability to the AIM-120C will be evaluated as will Tape 5 Rev 4 for the AIM-120B missile.

The P³I Phase 3 missile is scheduled to begin production in Lot 16 (FY04). This missile will incorporate new seeker and guidance sections as well as Operational Flight Program software written in a new language. A P³I Phase 3 Total System Performance Responsibility contract was signed with Raytheon Systems Company this fiscal year. Raytheon plans eight DT&E launches (for which they will define the test scenarios), and no captive carry reliability program to demonstrate the significantly modified AIM-120C missile's capabilities. A nine-shot (6 AF/3 Navy) OT&E will follow using the first Phase 3 production missiles. This test (FOT&E 4A) will be conducted by the Air Force's Air Combat Command and Navy's Air Test and Evaluation Squadron under AFOTEC and COMOPTEVFOR monitor, respectively.

TEST & EVALUATION ASSESSMENT

FOT&E(2) testing demonstrated fulfillment of the weapons effectiveness requirements in both countermeasure and non-countermeasure environments. Missile reliability, previously evaluated as unsatisfactory during IOT&E and FOT&E(1), was demonstrated to exceed user requirements by a wide margin during FOT&E(2). Rigorous FOT&E(2) testing of the "All Aspect Launch and Track" requirement called for 28 percent of the shots traversing the target's beam aspect. Another area of FOT&E(2) emphasis was missile effectiveness in the presence of targets employing self-screening chaff; 21 percent of launches were against such targets. Although significant improvements from IOT&E

performance were noted, concerns were not completely alleviated regarding missile capabilities in these two challenging environments.

FOT&E(3A) was conducted by the Air Force's 53d Wing and Navy's Air Test and Evaluation Squadron (AIRTEVRON) Nine (VX-9) at the Eglin Gulf Test Range, Eglin AFB, FL; White Sands Missile Range, NM; Utah Test and Training Range, UT; and NAWCWPNS Sea Range, Pt. Mugu, CA (NAWC-PM) from August 1996-August 1999 in operationally realistic scenarios. FOT&E(3A) was conducted to verify operational effectiveness and suitability of AIM-120B/C hardware and software updates (Lot 7/8/9/10 hardware, Tape 7 Revision 6, and Tape 7 Revision 7 for the AIM-120C and Tape 5 Revision 3 for the AIM-120B) verify correction of deficiencies and complete deferred or incomplete OT&E. Further details will be presented in the AMRAAM FOT&E(3A) Final Report. The anticipated publication date for this document is November 2000.

LFT&E results indicate that the P³I warhead works as designed. The final AMRAAM LFT&E Tests and Analyses Plans and Products (TAPP) Report is in review. Results indicate that the P³I warhead works as planned. Collection and evaluation of target damage data from the arena tests showed that the P³I warhead produced multiple fragment perforations and some internal component damage in the test targets. LFT&E was conducted on the basis of the information contained in the AMRAAM P³I TAPP version 4.1 and previously published data. DOT&E will publish its independent LFT&E report in early 2001.